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LAPPING DEVICE
[RAPPINGU SOUCHI]

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TITLE (54): LAPPING DEVICE

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[Scope of Claims]

[Claim 1] A lapping device provide with:

a lower surface plate and an upper surface plate provided in parallel to one another, and

a carrier interposed between this upper surface plate and lower surface plate to hold a wafer, wherein

a slurry is supplied from above the carrier;

said lapping device wherein through-holes are formed to pass vertically through the above-mentioned carrier.

[Claim 2] The lapping device of Claim 1 wherein the above-mentioned through-holes are a plurality of holes formed in a distributed manner substantially uniformly over the surface of the above-mentioned carrier.

[Claim 3] The lapping device of Claim 2 wherein the above-mentioned holes have an opening area of 0.8 to 20% of the total surface area of the carrier.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention] This invention relates to a lapping device used for lapping silicon wafers and the like, and in particular, an improvement in a lapping device that laps both sides of wafers simultaneously.

[0002]

[Prior Art] This kind of conventional lapping device was configured to perform lapping while inserting and holding wafers on a carrier and supplying a slurry onto the wafers from above. That is, a carrier was provided to freely rotate and revolve between a sun gear and a ring gear provided to freely rotate, and lapping work was carried out by pressing and slide-contacting the front and back sides (top and inferior surfaces) of the wafers held by this carrier against the upper surface plate and the lower surface plate. In this case, a slurry was supplied to the top surface of the carrier through holes formed in the upper surface plate.

[0003]

[Problems to be Solved by the Invention] However, in such a conventional lapping device, besides the holes holding the wafer, no through-hole was formed in this carrier; hence, the slurry hardly infiltrated to the lower side of the wafer. That is, with this conventional lapping device, the slurry was supplied from above the carrier during the lapping work; hence, although this slurry was supplied satisfactorily onto the wafer, it was hardly supplied to the inferior surface thereof. As a result, a problem occurred in that scratches readily developed on the inferior surface of the wafer.

[0004]

[Purpose of the Invention] It is an object of this invention to provide a lapping device that eliminates the occurrence of scratches on the inferior surface of the wafer. It is another object of this invention to provide a lapping device in which there is no cracking of the wafer by the lapping work.

[0005]

[Means for Solving the Problems] The invention of Claim 1 is a lapping device provided with a lower surface plate and an upper surface plate provided in parallel to one another and a carrier interposed between this upper surface plate and lower surface plate to hold a wafer, wherein a slurry is supplied from above the carrier; said lapping device wherein through-holes are formed to pass vertically through the above-mentioned carrier.

[0006] The invention of Claim 2 is the lapping device of Claim 1 wherein the above-mentioned through-holes are a plurality of holes formed in a distributed manner substantially uniformly over the surface of the above-mentioned carrier.

[0007] The invention of Claim 3 is the lapping device of Claim 2 wherein the above-mentioned holes have an opening area of 0.8 to 20% of the total surface area of the carrier.

[0008]

[Operation] According to the invention of Claim 1, a slurry is supplied from above the carrier during lapping work. This slurry

is supplied to the lower region of the carrier through a through-passage, that is, the inferior surface of the wafer that is held. As a result, a sufficient amount of slurry can be supplied between the inferior surface of the wafer and the lower surface plate, so the occurrence of scratches can be avoided entirely.

[0009] According to the inventions of Claims 2 and 3, during lapping work, the slurry is supplied from above the carrier. This slurry is supplied satisfactorily to the inferior surface of the retained wafer through a plurality of holes. Therefore, the occurrence of scratches can be prevented. Moreover, the opening area of the plurality of holes was set to 0.8 to 20% of the total surface area of the carrier, because the mechanical strength of the carrier itself can be maintained. And no cracking of the wafer held by the carrier occurs. This is because when the holes are formed with an opening area greater than 20%, for example, the carrier itself deforms during lapping, because the mechanical strength of the carrier is insufficient, and cracks may develop in the wafer, and moreover, when this value is less than 0.8%, the amount of slurry supplied to the inferior surface is not sufficient, and a problem of scratching occurs. The term “total surface area of the carrier” means the area of the entire top surface of the carrier including the holes for holding the wafer. In other words, when

the radius of the carrier is r and the total surface area is S, there is the relationship $S = \pi r^2$.

[0010]

[Embodiments of the Invention] A working example of this invention will now be described with reference to the drawings. Figures 1 to 3 are drawings depicting a working example of the lapping device pertaining to this invention. Figures 4 and 5 are graphs depicting a relationship between the opening area of the through-holes (based on the total surface area ratio of the carrier) and the occurrence of cracking of the wafer and scratches on the wafer.

[0011] As shown in Figures 1 to 3, this double-sided lapping device comprises a sun gear 11 provided to freely rotate around the axis, a ring gear 12 provided to freely rotate coaxially with this axis, and a disk-shaped carrier 13 that simultaneously meshes with both of these gears 11 and 12, to revolve and turn. A plurality of carriers 13 are installed around the sun gear 11, and four silicon wafers 14 are inserted

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into the hole in each carrier 13 and respectively held therein.

[0012] An upper surface plate 15 and a lower surface plate 16 are disposed on the top and bottom of each carrier 13 in parallel thereto. By supplying a slurry between the carrier 13 and the upper surface plate 15 and lower surface plate 16, the

front and back (top and inferior surfaces) of the respective silicon wafers 14 are lapped. That is, a plurality of through-passages 17 are formed in the upper surface plate 15 and are constituted so that the slurry is supplied between the inferior surface of the upper surface plate 15 and the top surface of the carrier 13 from a supply source through these through-passages 17. Moreover, as shown in Figure 2, a groove 18 (e.g., groove width: 2 mm, groove depth: 10 mm) is formed on each lapped face of this upper surface plate 15 and lower surface plate 17 [note: typographical error in original description].

[0013] With the lapping device pertaining to the above-mentioned configuration, a plurality of through-holes 19 passing through the above-mentioned carrier 13 is formed in the perpendicular direction thereto (in the vertical direction). The total opening area of these through-holes 19 is so set to 0.8 to 20% of the total surface area of the carrier 13. When this area is less than 0.8%, the amount of slurry supplied to the inferior surfaces of the wafers 14 is insufficient, and scratches develop in the inferior surface, as shown in Figure 5. Moreover, when the through-holes 19 are formed over more than 20% of this area, the mechanical strength of the carrier 13 itself becomes inadequate, holding of the wafers 14 is imperfect, and there is the risk that cracking of the wafers 14 will occur. A relationship between the opening area of the through-holes 19

and cracking of the wafers 14 is shown in Figure 4. Moreover, the opening area of one through-hole is ideally, for example, 60 cm^2 or less. In addition, a plurality of through-holes is dispersingly formed in a uniform manner over the total carrier surface. A slurry including, for example, a known composite artificial emery (FO) or the like is used for the slurry used for lapping.

[0014] Figure 4 is a drawing showing a relationship between the percentage of the total surface area of the carrier 13 occupied by the total opening area of the above-mentioned through-holes 19 and the occurrence of a cracked wafer by lapping employing this carrier 13. With this lapping, a slurry, including a composite artificial emery (FO #1200), was used as the lapping abrasive grains by the lapping device employing a cast iron carrier. An 8-inch diameter silicon wafer was lapped, and cracking thereof were observed visually.

[0015] Figure 5 is a drawing showing a relationship between the percentage of the total surface area of the carrier occupied by the total opening area of the above-mentioned carrier and the occurrence of scratches in the inferior surface of the wafer by lapping employing this carrier. Specifically, an 8-inch wafer was lapped by using a composite artificial emery (FO #1200) as the lapping abrasive grains and using a cast iron carrier, as in the case of Figure 4 above. As a result, scratches were visually

observed on the back of the wafer. As shown in these Figures 4 and 5, when the opening area of the through-holes 19 formed in the carrier is less than 0.8%, the occurrence of scratches increases, and when it exceeds 20%, the incidence of cracking of the wafer rises.

[0016]

[Advantages of the Invention] According to this invention, it is difficult for scratches to develop on the inferior surface of the wafer in lapping work. Moreover, cracking of the wafer does not occur either.

[Brief Description of the Drawings]

[Figure 1] A perspective view depicting the lapping device pertaining to a working example of this invention with a portion thereof broken away.

[Figure 2] A longitudinal section depicting the lapping device pertaining to the working example of this invention.

[Figure 3] A plan view depicting the carrier of the lapping device pertaining to the working example of this invention.

[Figure 4] A graph depicting a relationship between the opening area of the carrier through-holes of the lapping device pertaining to the working example of this invention and wafer cracks.

[Figure 5] A graph depicting a relationship between the opening area of the carrier through-holes and the incidence of scratches

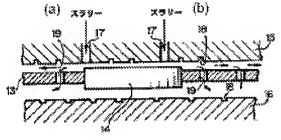
on the wafer of the lapping device pertaining to the working example of this invention.

[Description of the Codes]

13: carrier; 14: silicon wafer; 15: upper surface plate; 16: lower surface plate; 17: through-passage

[Figure 2]

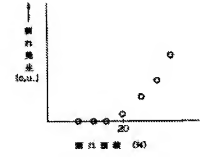
【図2】



Key: (a) slurry; (b) slurry

[Figure 4]

【図4】



Key: (X-axis) Opening Area (%); (Y-axis) Occurrence of Cracks (c.u.)

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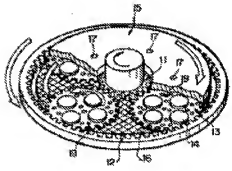
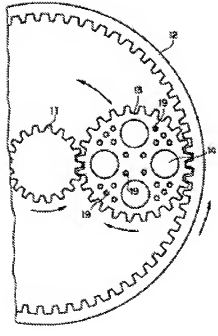
[Figure 1]

【図1】



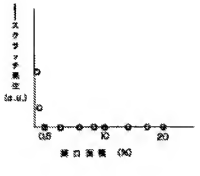
[Figure 3]

【図3】



[Figure 5]

【図5】



Key: (X-axis) Opening Area (%); (Y-axis) Occurrence of Scratches (c.u.)